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## SERPENTINE IN CALIFORNIA

The term serpentine is loosely applied to any of several members of a group of closely related, magnesium-rich minerals. It is also used as a name for rocks composed predominantly of minerals of the serpentine group. Most serpentine rocks are alteration products of peridotites that originally were composed predominantly of silicate minerals rich in magnesium and iron, such as olivine and some pyroxenes. Under subsurface conditions not fully understood, these hard silicate minerals combine with water to form softer serpentine minerals of much different physical character. As peridotite rock bodies are almost always partly serpentinized and as serpentine masses commonly contain some unaltered peridotite, the terms serpentine and peridotite are sometimes used interchangeably.

Serpentine is one of the most distinctive and widely distributed rocks of central and northern California. Most travelers in these parts of the state are familiar with the characteristic pale green, highly polished serpentine exposed in many road cuts. Equally distinctive are the serpentine terranes strewn with blocks or scattered piles of blocks, which are commonly in sharp contrast to nearby relatively smooth slopes developed on most other rocks with which serpentine is associated. This tendency of serpentine to crop out prominently and to weather to a rusty red color led the early settlers to name many Red Mountains and Red Hills in the Coast Ranges and Sierran foothills.

The accompanying map shows the wide distribution of serpentine in the Coast Ranges, Klamath Mountains, and foothills of the Sierra Nevada. With the exception of a few outcrops on Santa Catalina Island, no masses of this rock of significant size have been found in California outside of the area included on the map. Serpentine usually occurs as elongated masses which tend to be oriented parallel to the regional structure. Individual masses range in outcrop area from less than an acre to more than 100 square miles, and more than 1200 square miles of serpentine outcrops have thus far been mapped in California.

Peridotites, from which most California ser-

pentines are derived, are medium- to coarse-grained rocks consisting of various proportions of olivine and iron-magnesium-rich pyroxenes. These rocks are given varietal names according to the kind and abundance of minerals in them. A variety composed almost entirely of olivine is called dunite; one with more than 95 percent pyroxene is called pyroxenite. The most common variety contains large amounts of both olivine and the pyroxene enstatite, and is called saxonite. Although saxonite masses are most common, dunite and pyroxenite may occur anywhere within saxonite as irregular bodies. Dikelets of dunite and pyroxenite may cut the saxonite and each other as well.



Serpentine terrane showing typical blocky outcrop. Smooth slopes at right underlain by sandstone.